

BOTANY.—*Kokonoria*, a new genus of *Plantaginaceae* from *Tsinghai Province, China*.¹ YI-LI KENG and KWAN-HOU KENG, National Central University, Chungking, China. (Communicated by EGBERT H. WALKER.)

In the summer of 1944 the authors had an opportunity to undertake an expedition to the northwestern part of China. They went to Lake Kokonor in Tsinghai Province and to Labrang in Kansu Province with a view to investigating the grazing lands and the forage plants of these regions for the National Research Bureau of Animal Industry, China. During this survey they collected nearly a thousand numbers of botanical specimens, which are now deposited in the herbarium of the National Central University. Naturally there were many novelties found in these two botanically very little known regions. One of these specimens represents a new genus of *Plantaginaceae*, described herewith. Although the study of the whole collection is far from complete, it seems desirable to publish this new genus at the present time.

The authors wish to express here their gratitude to Dr. Vougi Tsai and Prof. Tieh-tsai Chang, the director and vice-director, respectively, of the Bureau, through whose zealous recommendation, kind assistance, and financial maintenance the authors were able to conduct the expedition successfully.

*Kokonoria*² Keng & Keng f., gen. nov.

Flores hermaphroditi, zygomorphi, trimeres, receptaculo brevissime cupulari, juventate tenuiusculo; calyx gamosepalus, persistens, bilobatus, lobis membranaceis, lateraliter positus, saepissime antice vix conjunctis; corolla sympetala, ad maturitatum subcoriacea sed decidua, breviter trilobata, lobis deorsum imbricatus, duobus anticis minoribus, tubo quam limbo multo longiore, interdum ad fauces constricto, arcte ad marginem receptaculi cupularis affixo; stamina 2 (tertium anticum absens), inclusa vel vix exposita, ad vel infra incisiones duas laterales inter corollae lobis inserta; antherae ad maturitatem inversum V-formae, subsessiles vel a filamentis brevissimis fultae, thecis duabus divergentibus, longitu-

dinaliter dehiscentibus, distinctis vel apice confluentibus; pollen ellipsoideum, longitudinaliter 3-sulcatum; discus perigynus, annularis sed serius utrimque lobis duobus elevatis accrescentibus appendiculatus; ovarium liberum, breviter stipitatum, biloculare, loculis 1-ovulatis; stylus unicus, terminalis, dimorphus, aut brevis inclususque aut longior exsertusque, stigmatibus terminali, paulum bilobulato; ovula linearis, anatropa, ex apice loculi ovarii pendula; fructus drupaceus, bractea atque lobis duobus calycis subtentus, biseminalis, mesocarpio textura spongiosulo; semina dorsaliter compressa, anguste oblongilanceolata, exalbuminosa, in sectione semicircularia, testa tenui, laevi; embryo rectus, radícula brevissima, superiore, cotyledonibus oblongis, subcarnosis. Herbae perennes, humiles, stoloniferae; rhizomata crassa, foliorum basibus emarcidibus fibrillosis vestita; folia radicalia, alternata, simplicia, integra, inferne attenuata sed basi in structuram membranaceam vaginis similes dilatata; flores parvi, bracteati, desiccatione nigri, in scapis axillaribus quam foliis brevioribus spicati, bracteis magnis, in anthesi praeter eas margines liberas lateri antico receptaculi cupularis inferne plus minusve adnatis. Species unica, provinciam Tsinghaii, prope mare conclusum Kokonoris habitans.

Flowers hermaphrodite (always so?), zygomorphic, trimerous, the receptacle shortly cupular, rather thin in texture when young (as also the calyx); calyx gamosepalous but usually much less united in front, persistent, laterally 2-lobed, the anterior lobe entirely wanting but replaced in the corresponding position by a large bract adnate below to the cupular receptacle but with free margins; corolla sympetalous, thickened in anthesis but deciduous in fruit, shortly 3-lobed, the posterior lobe larger, descending-imbricate, the tube much longer than the limb, firmly attached to the margin of the receptacle, sometimes constricted at the throat; stamens 2 (the anterior stamen wanting), included or scarcely exposed, inserted at or just below the two lateral notches between the corolla lobes; anthers inverted V-shaped at maturity, subsessile or with short filaments,

¹ Received October 26, 1945.

² From "Kokonor," which means in Mongolian the "blue sea."

the two cells divergent, dehiscing lengthwise, distinct or confluent at apex; pollen grains ellipsoidal, longitudinally 3-furrowed; disk perigynous (its attachment seen in a young flower a little below that of the corolla tube), annular but later appendaged on both sides with two prominent elevated lobes; ovary superior, shortly stipitate, bilocular, each locule 1-ovuled; style 1, terminal, dimorphic (either short and included or slender and exerted) with a terminal slightly 2-lobed stigma; ovule linear, anatropous, pendulous from the apex of the ovary cell; fruit drupaceous, subtended by a bract and two calyx lobes, 2-seeded, the mesocarp somewhat spongy in texture; seeds dorsally compressed, narrowly oblong, exalbuminous, semicircular in section; testa thin, smooth; embryo straight, with a short superior radicle and two somewhat fleshy cotyledons. Perennial stoloniferous low herbs with simple stout rhizomes, which are covered with emarcid fibrillose leaf bases; leaves radical, alternate, simple, entire, attenuate below but broadened at base into membranous sheathlike structures; flowers small, bracteate, spicate on axillary scapes shorter than the leaves. One species endemic near Lake Kokonor, Tsinghai Province, China.

Heretofore only three not closely related genera, *Plantago*, *Littorella*, and *Bougueria*, were known in the Plantaginaceae, all acaulescent herbs with radical leaves and axillary scapes. The genus here described is an isolated one, differing from the others in having (1) perigynous flowers with an annular disk giving off two lateral accrescent lobes, (2) subsessile anthers with divergent anther sacs, (3) solitary linear ovules pendulous from the tip of the ovary cells, (4) drupaceous fruits with a 2-celled pyrene, and (5) dorsally compressed but not peltate seeds without endosperm. Comparatively it shows an affinity to the genus *Bougueria*, which is polygamous, monotypic, and endemic on the high Andes. The 3-merous corolla and the 2-membered androecium of *Kokonoria* is also found in *Bougueria*, but *Kokonoria* differs from that in the 2-lobed calyx, bilocular ovary, and the straight embryo, *Bougueria* having a calyx of four linear sepals, an ovary unilocular, and an embryo curved around the albumen.

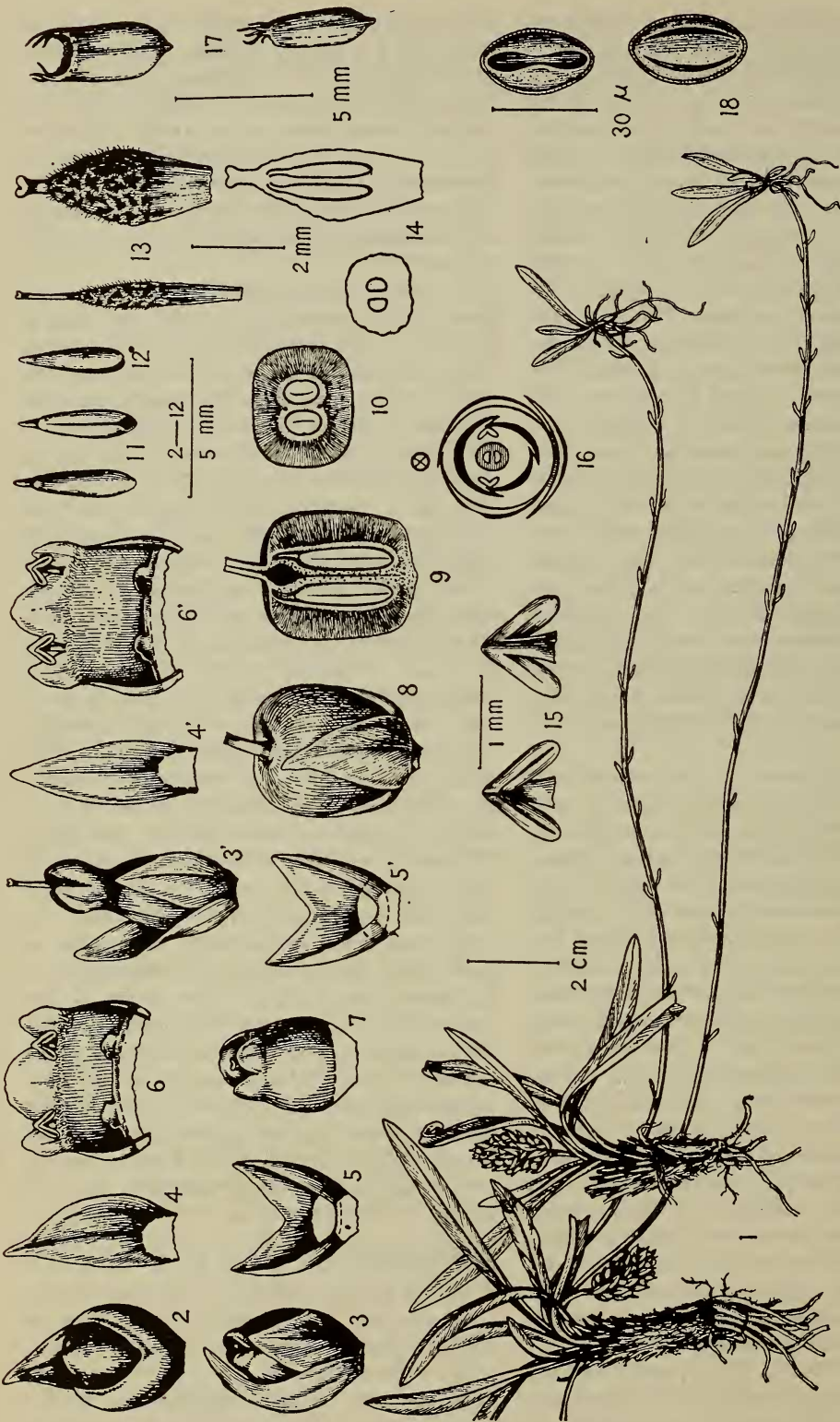
According to Dr. S. Ting, professor of geography at National Central University and a specialist on pollen grains, the ellipsoid, 3-

furrowed pollen of this genus is of a common type found in several families, such as Scrophulariaceae and Umbelliferae. He says it is quite different from that of *Plantago*, which has rounded many-pored pollen grains. It seems also very worth while to compare the pollen of *Kokonoria* with that of *Littorella* and *Bougueria*, but, unfortunately, the material and literature now available here are inadequate for study of this kind.

It seems very probable that the 4-merous flower of the cosmopolitan genus *Plantago* is formed through the reduction of the posterior odd sepal and the union of the posterior two corolla lobes from a 5-merous sympetalous type such as the Scrophulariaceae. A comparison of the floral structure of *Plantago* with that of *Veronica* indicates this conception to be correct. As a result of this reduction, the four sepals are placed diagonally and the four corolla lobes crosswise. When the anterior two sepals of this 4-merous flower are further completely united and the anterior petal suppressed, a 3-merous flower is evolved such as is found in *Kokonoria*. There is, however, in *Kokonoria* a tendency toward reduction to a 2-merous structure, for the anterior sepal and anterior stamen are entirely reduced. A further reduction in the union of its anterior two corolla lobes into a single segment would bring the flower to a complete dimerous state. Hence, the genus *Kokonoria* is evidently much more advanced than *Plantago* is the reduction of its floral structure. Furthermore, the development of a perigynous flower, annular disk, and exalbuminous seeds also shows an advancement of *Kokonoria* over the other three genera of Plantaginaceae in the evolutionary scale. But the evolutionary development of Plantaginaceae apparently culminates in the production of a dimerous flower with inferior or half-inferior ovary. A plant with such a floral structure has been found in *Circaea*, which reaches the climax of development in Onagraceae, but it is still to be discovered in the plantain family.

***Kokonoria stolonifera* Keng & Keng f., sp. nov.**

Herbae perennes, glabrae; rhizomata erecta, 1.5-3 cm alta, 1 cm crassa (foliorum basibus persistentibus fibrillosis includentibus); stolonones axillares, graciles, circ. 20-30 cm longi, foliis squameis reductis instructi, in plantas juveniles parvas terminantes; folia rosulata,



FIGS. 1-18.—*Kokonoria stolonifera* Keng f., drawn from type: 1, habit; 2, posterior view of a plumper flower; 3, lateral view of same; 3', lateral view of a thinner flower; 4, 4', interior views of bracts, lower unshaded part showing degree of adherence to cupular receptacle and calyx tube; 5, 5', calyces with cupular receptacle below dotted circle; 6, 6', interior views of expanded corollas showing stamens and annular disk with its appendages, part below dotted line belonging to cupular receptacle; 7, plumper flower with bract and calyx removed, showing corolla inserted on cupular receptacle as a whole; 8, fruit with persistent bract, calyx, and style-remnant; 9, 10, longitudinal and cross section of fruit; 11, posterior and anterior views of seed; 12, embryo showing short superior radicle and two cotyledons; 13, two pistils, the one slender from a thinner flower, the other stout from plumper flower; 14, cross and longitudinal section of pistil; 15, anterior and posterior views of stamen; 16, floral diagram; 17, side (above) and face (below) views of a stone; 18, two views of a pollen grain. 4, 5, and 6 are drawn from plumper flowers; 4', 5', and 6' are from thinner flowers.

obscure viridula, plus minusve carnosa, anguste lanceolata, 15–55 mm longa, 5–6 mm lata, inferne attenuata et petiolis similia, costa media infra prominenti, supra depressa; pedunculi compressiusculi, circ. 1.5 cm longi, 1 mm lati sed sursum versus apicem paulum dilatati; spicae pauci- vel pluri-florae, 1–2 cm longae, circ. 1 cm crassae, erectae vel ad maturitatem pendulae; bractea straminea, membranacea sed dorso firmula, oblongi-lanceolata, 7–8 mm longa, 2–3 mm lata, integra, acutiuscula vel obtusa; flores subsessiles, conferti vel inferiores remoti; calycis tubus saepissime altitudine inaequalis, in latere antico circ. 1.5 mm altus et in postico 2.5 mm, lobis ovatis, in anthesi late patentibus, 3–3.5 mm longis, 3 mm latis, margine late scariosis sed costa media viridulis, prope apicem crispe ciliolatis; corolla juvenilis membranacea albidaque, aetate subcoriacea puniceaque, tubo circ. 5 mm longo, 3 mm in diametro, extus glabro sed intus ad fauces puberulenti, desiccatione nigro, irregulariter rugoso, posteriore plus minusve inflato, lobis erectis, obtusis, ovatis vel subrotundis, colore quam tubo siccano clarioribus, uno postico quam duobus anticis longiore sed multo latiore, interdum emarginato, 1–1.5 mm longo, 1.5 mm lato; disci lobi oblongi, cuneati, vel quadrangulares, 1.5–3 mm longi, 1–2 mm lati, ad maturitatem subcoriacei, irregulariter divisi vel erosi, fusci-brunnei, super ovarii stipitem incumbentes; staminis filamentum brevissimum, usque ad 1 mm longum; antherae flavidi-brunneae, thecis circ. 1 mm longis; pollen 30–40 μ longum, 13–23 μ latum, sulcis 3 profundis longitudinalibus pervagatum, tenuissime sed irregulariter granulare; ovarium juvenile lateraliter compressum, ellipticum glabrumque, serius lineari-oblongum vel fusiforme, circ. 3.5 mm longum (stipite glabro includente), 1–2 mm crassum, superne puberulum et irregulariter rugosum; stylus sive crassus circ. 0.5 mm sive gracilis usque ad 5 mm longus, stigmatate capitulato, laevi, minute bilobulato; fructus globularis, 5–7 mm longus, 3–5 mm in diametro, glaber, fusci-brunneus, stylo vel eius residuo persistente superatus, pericarpio siccano, circ. 1.5 mm crasso, pyrena lignosa, nigrescente, tereti sed leviter lateraliter compressa, 4–5 mm longa, 2 mm lata (in latere latiore), basi breviter constricta, apice crescente (in aspectu laterali), in margine antero-posteriore fibris erectis lignosis fimbriata; semen albidum,

4 mm longum, 1 mm latum, extrinsecus canaliculo tenui longitudinali medio sulcatum; embryo semine paulum brevior, cotyledonibus plano-convexis, ultra 3 mm longis.

Perennial glabrous herbs; rhizomes upright, 1.5–3 cm tall, about 1 cm thick including the straw-colored fibrillose leaf bases; stolons slender with scalelike leaves, about 20–30 cm long, terminating in small plantlets; leaves several in a rosette, dark green, more or less fleshy, narrowly lanceolate, 1.5–5.5 cm long, 0.5–0.6 cm wide, acute, attenuate and petiolelike below, the midrib prominent beneath, depressed above; peduncle 2-edged, about 1.5 cm long, 1 mm wide but somewhat broadened toward the apex; spikes several- to many-flowered, 1–2 cm long, about 1 cm. thick, erect or pendulous at maturity; bract stramineous, membranous but somewhat firm dorsally, oblong-lanceolate, 7–8 mm long, 2–3 mm wide, entire, acutish or obtuse; flowers subsessile, crowded or the lower ones somewhat remote; calyx tube (including the cuplike receptacle) usually asymmetric, about 1.5 mm on the anterior and 2.5 mm long on the posterior side, the lobes ovate, wide open in anthesis, 3–3.5 mm long, 3 mm wide, broadly scarious with prominent green midribs, crinkled-ciliolate near the apex; corolla membranous and whitish when young, subcoriaceous and pinkish when mature, the tube about 5 mm long, 3 mm across, glabrous outside, puberulent at the throat within, irregularly wrinkled when dry, dorsally more or less inflated, the lobes erect, obtuse, ovate or somewhat rounded, lighter in color than the tube (seen in dry specimens), the anterior two slightly shorter but much narrower than the posterior one, which is sometimes emarginate, 1–1.5 mm long, 1.5 mm wide; disk lobes oblong, cuneate or quadrangular, 1.5–3 mm long, 1–2 mm wide, irregularly cleft, subcoriaceous at maturity, dark brown, pressed against the stipe of the ovary; filaments from very short to 1 mm long; anthers yellowish brown, with sacs about 1 mm long; pollen 30–40 μ long, 13–23 μ wide, longitudinally traversed with three deep furrows, the exine finely but irregularly granular; ovary laterally compressed, elliptic and glabrous when young, later becoming linear-oblong to fusiform, about 3.5 mm long (including the glabrous stipe), 1–2 mm thick, puberulent and irregularly wrinkled; style either stout, about 0.5 mm long, or slender

and up to 5 mm long; stigma capitulate, smooth, bilobed; fruit globular, 5-7 mm long, 3-5 mm across, glabrous, dark brown, surmounted by the persistent style or its remnant, the pericarp dry, about 1.5 mm thick; stone (pyrene) woody, nigrescent, terete but somewhat compressed laterally, 4-5 mm long, 2 mm wide (the broader side), shortly constricted at base, crescent at apex (in side view) with erect wood fibers on the anterior-posterior margins; seed whitish, 4 mm long, 1 mm wide, outwardly sulcate with a fine longitudinal median groove; embryo slightly shorter than the seed, with planoconvex cotyledons over 3 mm long.

Type in the Herbarium of the Department of Biology, National Central University, Chungking, China, collected on the exposed bare ground of the steppe, near the ruined city Ch'a-han-chêng, (察汗城), about 30 miles east of Lake Kokonor, Huan-yüan-hsien (渾源縣), formerly known as Tan-ké-erh (丹噶爾), Tsinghai Province, August 10, 1944, by Y. L. Keng and son (no. 5286).

There are two kinds of flowers (see Figs. 3 and 3') in this species, one near the base of the spike having plumper corollas, subsessile anthers, and short included styles, the other on the upper part with rather slender corollas constricted at the throat, very short but distinct stamen filaments, and longer exerted styles. Though each flower form possesses two well-developed stamens and a pistil, all the fruits seen are found to have a rather long style or its remnant at the apex. Therefore, further examination is needed to decide whether the flower with a short included style is fertile. It

is quite certain, however, that the flowers are all entomophilous, since the anthers never exceed the erect corolla-lobes which would be necessary for wind pollination. The zygomorphy of the flower is shown not only by the corolla with three unequal lobes but also by the calyx, which usually has an unequal union of the two laterally placed sepals.

The bract of a rather young flower is dorsally more or less adherent below to the anterior side of the very short cupular receptacle including the calyx tube. But the short calyx tube is sometimes also found to be distinctly exposed in front beyond the adnate portion of the bract. No matter how much the adherence of the bract, the margins are always quite free from either the receptacle or the calyx. If there were no such free margins present, the bract would be easily mistaken in morphology for an anterior lobe of the calyx, which, like the anterior stamen, is entirely suppressed in this species. The corolla is at first distinctly perigynous and very thin in texture but becomes much thicker or even coriaceous at maturity and appears to have increased its size and thickness downward so much that it seems thenceforth to be hypogynous. The deciduousness of the corolla is perhaps caused by the protrusion of the enlarged fruit, which ruptures the corolla and causes it eventually to fall off. Another peculiarity is that the annular disk, which is also perigynous with an attachment a little below the corolla, gives off on both sides two large thick and variously shaped appendages during its development from youth to maturity.

ENTOMOLOGY.—*Synoptic revision of the United States scarab beetles of the subfamily Dynastinae, No. 1: Tribe Cyclocephalini.*¹ LAWRENCE W. SAYLOR, Research Associate, California Academy of Sciences.

The important subfamily Dynastinae has for some time been relatively neglected, taxonomically speaking, and only in the past few years have new species been described or the larval characters of many species better characterized. In all collections I have seen, numerous United States species are grossly misidentified, and it is hoped that the present papers will help to rectify this condition.

¹ Received August 13, 1945.

Ritcher's paper (1944) is an excellent contribution to the immature stages of these insects. His title, however, *Dynastinae of the United States*, is very misleading, because this paper includes only a small proportion of the described United States species, and only those adults are mentioned of which he had larvae; thus, of the 18 described genera and 119 United States species listed as valid in Arrow's latest catalogue (1937), Ritcher treats the larvae and adults of but 12 genera and 20 species. Even though a